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Technological parameters of some foreign genotypes and diversion of these parameters against the country of origin

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Abstract

This work presents the characterization of olive fruit from 26 olive varieties, grown in Vlora Albania. In the olive fruit have been determined: index of ripening, fruit weight, the ratio pulp/pit, the percentage of humidity, the fat content and the percentage of fat content on a dry matter.
The olive fruit variety analyzed showed a fruit weight ranged between 1.21–6.68 g. 'NocelaraMessinese' variety presented the highest values of fruit weight, while 'Pendolino' variety showed the highest value for the ratio pulp/pit (9.76 g).
Most of the varieties have shown high humidity content which ranged 34.16–64.81%. The cultivars 'Frantoio', 'Simeone', 'Moraiolo' and 'Toscanina' have shown lower values in humidity. The fat content has achieved very interesting concentrations; the fruit from 'Dolce di Cassono' cultivar showed the highest value (19.83%) the lower value in this parameter was shown by 'Cellina di Nardo'. Regarding the percentage of fat content on a dry matter, the fruit of variety of 'San Agostino' presented the highest level (50.46%). The results obtained in this work conclude that this cultivar has a great technological interest for planting. Some of the cultivars can be used only for olive oil extraction and some for table olives.

Keywords: *Olive Fruit; Olive Tree; Cultivar, Olive oil extraction.*

1. Introduction

The olive tree (Olea Europaea L.) grows in a subtropical climate as a traditional main familiar crop in Mediterranean countries. It probably originates from Mesopotamia and has been cultivated from many centuries in southern European countries bordering the Mediterranean and in North Africa [1, 2, 3].
World production of olive oil has constantly risen over the last ten years and Mediterranean countries account for more than 90% of all the olive oil produced in the world [4]. Olive oil is obtained from olive fruit a natural product containing a wide range of bioactive compounds and is a key component of the traditional Mediterranean diet. The olive fruit generally contains 50% water, 20% oil, 20% carbohydrates, organic acids, pigments, phenolic compounds and minerals as rest [5]. The oil contains high levels of phenolic compounds and 70% of unsaturated fatty acids which are believed to be associated with a relatively long life and good health [6]. Olive oil is usually extracted by mechanical pressing. Most of olives fruits are utilized naturally ripen, in brine or as a source of oil. As fruit colour develops some changes occur including fruit weight, moisture content and flesh to pit ratio, fat content and oil composition [5, 7]. Fresh fruit weight increases with maturity for most olive cultivars. The moisture content of the fruit decreases as the fruit matures. The oil content in the fruit is related to the degree of maturity [8].
However, the composition of the olive fruit may vary depending on harvest time, method of collection, storage of fruit, time between collection and processing at the mill. The most appropriate time for the harvest of olives for oil extraction is when the fruit

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reaches its optimum ripeness. At this time, the oil content and his quality are at the highest levels [9].
The main components which are determined are the oil and vegetable water. The total oil content is necessary to evaluate the performance of the manufacturing process following the fruit parameters. On the other hand, the vegetation water of the olive itself affects different variables on the work system regulation especially the so-called two phases which is related to industrial performance, such as: the position on the axis of rotation, the exit point of the oil and addition of water to the decanter [10].

The cultivation of Olive tree in Albania is situated mostly in western Mediterranean climate area, and represents 36.2% of the Albanian territory [11]. In recent years there is a tendency to increase the cultivation of olive trees in the interior areas. The main objective of this study is to gather information about the behavior of some cultivars with different origin in the same environment petrology, climate and technology, which will serve for the propagation and cultivation of new crops.

2. Material and Methods

This work was carried out during 2014-2015. For this study 26 Italian olive cultivars were chosen. The trees were planted in the area of Vlora. The planting distance was 6x6 meters without irrigation. Five trees for each cultivar were analyzed for fruit quantitative and qualitative characters. The main characteristics observed were: repining index, fruit weight, stone weight, percentage of humidity and the percentage of oil in fruit.

2.1. Fruit Physical Characteristics:

Ripening index: The maturity index is a method which is based on phenotypic changes of the color of the skin and the endocarp of fruit [12]. The homogenized samples obtained from 100 fruits and classified into 7 categories. Maturity index (PI) is the sum of the counted fruits for each class multiplied by the number of class over the total fruits. The resulting value of the maturity index is expressed in a scale from 0 to 7. The calculation of the index is as follows.

$$IM=ax0 + bx1 + cx2 + dx3 + ex4 + fx5 + gx6 + hx7100$$

Fruit weight: Was determined by weighing the samples (100 fruits) using electronic scale with 0.01 gr sensitivity and average weight per fruit was calculated.

Ratio of pulp/pit: Seed weight was determined by weighing the sample (100 pits) and average weight of seed was calculated. Pulp/pit ratio was calculated by dividing the weight of the flesh over the weight of the pit.

Ratio pulp/pit is calculated by the following formula:

$$\boldsymbol{Relacionpulp/seed = \frac{Pf - Ps}{Ps}}$$

2.2. Chemical Characteristics

Moisture Content: It was determined by drying the flesh in an oven at 60-80°C until a constant weight according to A.O.A.C. [13].

Oil Percentage: Fruit oil content was determined by means of the Soxhlet fat extraction apparatus using Hexane of 60-80°C boiling point as described by A.O.A.C. [13].

2.3. Statistical analysis

For each sample three replicas were used. Variable analysis (coefficient of variation) was performed using sas/stat software**.**

3. Results and Discussion

The repining index is a very important parameter because is closely related to the accumulation of oil in the fruit [14].The repining index determines the optimal time of harvest of the fruit, maturation period is affected by weather conditions and varietal characteristics [15]. When the maturity index reaches values close to 3.5, the oil content and the chemical component are present in high values [16]. The repining index of cultivar studied is shown in the Table 1.

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Variety	Weight fruit (g)	Weight Stone (g)	Ratio P/E	Maturity Index	Date of collection
Ascolana	2.56	0.43	4.91	4.3	14/10/2015
Carole	4.09	0.46	7.80	3.2	14/10/2015
Cellina di Nardo	3.92	0.54	6.32	3.6	14/10/2015
Cima di Melfi	2.62	0.51	4.17	4.1	14/10/2015
Cipressino	1.52	0.34	3.52	0.9	14/10/2015
Coratina	2.20	0.36	5.12	1.9	14/10/2015
Dolce di Cassono	1.21	0.25	3.83	1.5	14/10/2015
Frantoio	1.42	0.27	4.29	4.5	14/10/2015
Itrana	3.24	0.3	9.76	4.1	14/10/2015
Leccino	1.99	0.37	4.35	1.1	14/10/2015
Moraiolo	4.50	0.49	8.21	6.0	14/10/2015
NocelaraMessinese	2.76	0.37	6.42	2.4	14/10/2015
Nociara	2.19	0.44	3.99	1.0	14/10/2015
Nolca	4.68	0.58	7.05	5.3	14/10/2015
Ogliarola	2.06	0.36	4.64	1.0	14/10/2015
Oliastro	2.44	0.46	4.29	1.0	14/10/2015
Passola	2.66	0.46	4.83	4.0	14/10/2015
Passola di Andria	3.19	0.47	5.82	2.4	14/10/2015
Pazzinicelio	6.13	0.58	9.65	3.0	14/10/2015
Pendolino	3.59	0.54	5.64	0.7	14/10/2015
Peranzana	3.68	0.35	9.52	1.0	14/10/2015
Picholino	1.57	0.24	5.46	2.4	14/10/2015
San Agostino	4.81	0.49	8.82	1.9	14/10/2015
Simone	2.16	0.46	3.68	1.0	14/10/2015
Termite di Bitetto	6.68	0.74	8.01	1.6	14/10/2015
Toscanina	3.47	0.33	9.56	0.7	14/10/2015
Mean	3.12	0.43	6.14	2.48	
StdDev	1.40	0.11	2.11	1.56	
Std Err Mean	0.27	0.02	0.41	0.31	
Upper 95% Mean	3.69	0.47	6.99	3.12	
Lower 95% Mean	2.56	0.38	5.28	1.85	
CV	45.1	25.0	34.4	62.5	

As shown on Table 1. cultivars 'Passola', ' Passola di Andre', 'Dolce di Cassono', 'Frantoio', 'Cellina di Nardo', 'Pendolino', 'Termite di Bitetto', 'Leccino' and 'San Agostino' presented a maturity index over 3, which means that these cultivars may be considered as early maturing cultivars.

As shown on Table 1 the fruit weight varies depending on the variety. 'NocelaraMessinese' presents larger fruits, while the variety 'Toscanina' has smaller one. The cultivars 'Coratina', 'Cima di Melfi' and 'Moraiolo' have a similar size between them.

The weight of the olive varies between the varieties but also within the same variety, as this parameter is affected by the axle load and weather conditions [17].

The ratio pulp/pit which is at the same time correlated with the size of the fruit, is a key factor of oil yield because the oil of the pulp represents over 95% of the total olive oil in the fruit.

Of all the varieties studied, the 'Toscanina' shows the higher value of ratio pulp/pit, while the 'Simone' cultivar is the one with the lowest value, as shown in Table 1. The ratio pulp/pit is influenced by the genetic factor and weather conditions [17].

The percentage of humidity of the cultivars of this study is shown in Table 2.

Table 2. The percentage of humidity, Oil content in fresh matter and the percentage of oil contend of 26 cultivars foreign cultivated in Albania

Cultivar	% Humidity	% Oil Content in fresh matter	% Oil Content
'Passola'	54.74 ± 0.8a	42.83 ± 1.7	19.37 ± 0.4
'Passola di Andria'	64.81 ± 0.7	48.20 ± 0.4	16.96 ± 0.3
'Dolce di Cassono'	36.38 ± 2.7	31.27 ± 1.9	19.83 ± 0.6
'Frantoio'	34.56 ± 1.9	27.66 ± 0.7	18.08 ± 0.2
'Simone'	35.11 ± 0.5	16.41 ± 0.2	10.65 ± 0.1
'Moraiolo'	34.16 ± 5.3	24.44 ± 2.9	15.90 ± 0.1
'Toscanina'	34.61 ± 1.7	21.65 ± 0.8	14.14 ± 0.1
'Cellina di Nardo'	62.28 ± 0.7	26.24 ± 2.1	9.88 ± 0.5
'Pendolino'	64.20 ± 0.7	29.45 ± 0.9	10.54 ± 0.1
'Oliastro'	60.63 ± 0.5	25.44 ± 0.8	10.01 ± 0.2
'Nolca'	64.33 ± 0.5	27.75 ± 1.2	9.89 ± 0.4
'Cipressino'	61.72 ± 0.5	43.00 ± 2.1	16.45 ± 0.5
'Cima di Melfi'	62.02 ± 0.5	27.37 ± 1.4	10.39 ± 0.3
'Termite di Bitetto'	60.37 ± 0.4	45.81 ± 5.9	18.13 ± 2.2
'Nociara'	60.56 ± 0.6	30.97 ± 0.9	12.21 ± 0.1
'Peranzana'	56.25 ± 1.0	29.76 ± 1.5	13.01 ± 0.5
'Leccino'	58.46 ± 0.7	35.73 ± 1.1	14.83 ± 0.2
'Pazzinicelio'	63.55 ± 0.8	37.00 ± 1.8	13.48 ± 0.6
'San Agostino'	63.20 ± 0.7	50.47 ± 1.0	18.57 ± 0.4
'Itrana'	59.93 ± 0.1	39.17 ± 1.5	15.69 ± 0.6
'Picholino'	60.26 ± 0.4	43.07 ± 0.4	17.11 ± 0.2
'Ogliarola'	60.58 ± 1.1	40.50 ± 2.3	15.94 ± 0.4
'Carole'	60.25 ± 0.1	49.47 ± 0.4	19.67 ± 0.1
'Coratina'	58.16 ± 0.6	32.16 ± 0.5	13.45 ± 0.3
'NocelaraMessinese'	60.79 ± 0.2	42.98 ± 0.3	16.85 ± 0.1
'Ascolana'	62.98 ± 0.8	34.68 ± 0.7	12.83 ± 0.2

a – Mean ± SD

The fruit of 'Passola di Andria' cultivar shows the highest value of humidity (64.81 ± 0.7), while 'Moraiolo' cultivar has the lowest average value. The humidity is the percentage of moisture in the fruit, which is related to the rate of maturity, so the increase of the maturity index, reduces the moisture along with some of the volatile compounds present in olive pulp [18]. The moisture content of the olives at the time of harvest is an important parameter since it influences the performance and final quality of the oil obtained.

The fat content of fruit expresses the completion of forming of oil in the olive fruit. The content is influenced by the variety and the characteristics of fruit development. Once lipid synthesis stops, this parameter remains constant [19].

The mean of percentage of oil content of 26 cultivars is represented in Figure 1.

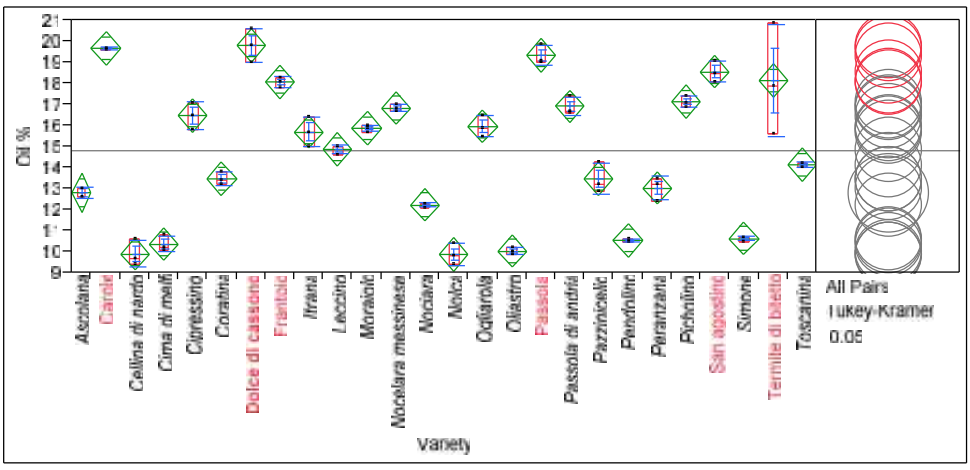

Figure.1. The variability of content of fat in olive fruit of 26 cultivars study (P < 0.05)

As seen from Table 2 the percentage of fat in the fruit samples taken into exam shows variability, which may be imputed to the metabolism of the fruit and to his genetic factor. According to the statistical analysis carried out with ANOVA ONE WAY this variability had a $P < 0.05$. The Olive cultivars taken into analyzed had a mean fat content of 14.78%. The cultivars 'Nolca' and 'Cellina di Nardo' had a lower content.

4. Conclusions

From this study can be reported, that the analyzed cultivars need to be harvested at a maturity index of 3 – 4 from the results we obtained, the weight of the fruit, the ratio pulp/nucleus and the percentage of moisture and fat, provide the optimal value for the extraction of olive oil. Cultivars 'Passola' 'Dolce di Cassono' 'Carole' show technological interest and can be recommended for cultivation in Albania, however it would be advisable to study the agronomic and climatic parameters in Albania to see if these cultivars adapt well.

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